Advanced Treatment Alternatives
continued from other side

REVERSE OSMOSIS

Reverse osmosis is a high-pressure membrane process capable of removing bacteria, viruses, dissolved organic matter and salts from liquids. Because of the small pore size, reverse osmosis operates most effectively on wastewater that has been subjected to microfiltration or ultrafiltration pretreatment. Particles that cannot pass through the reverse osmosis membrane are concentrated in a sidestream that must be treated or disposed. This reject stream typically amounts to 15 percent of the influent flow. Reverse osmosis produces extremely high quality water for industrial processes and potentially some reuse applications that cannot tolerate salts or dissolved organics.

Where do we go from here?

Reclaimed water will play an increasingly important role in the Pacific Northwest in the future. Different applications of reclaimed water will have different water quality objectives. To produce reclaimed water suitable for most non-potable applications such as irrigation and industrial uses, it must meet a minimum of Class A standards. Some applications may have even more rigorous requirements. Newer technologies that are compact, remove pollutants efficiently, are easy to maintain, and easy to automate may offer advantages over conventional technologies.

This demonstration project is testing the performance and operation of several systems that offer these advantages. This testing program began in June 2001 and will be completed in February of 2002. The machines are in operation now. In-depth monitoring of performance and testing of water quality is being done. Equipment malfunctions and ease of repair and operations are being evaluated. All the information from this study will be taken into consideration as we look towards siting our first Reclaimed Water Production Facility in the Sammamish Valley.

For more information, contact Jo Sullivan at 206-296-8361 or jo.sullivan@metrokc.gov.

King County, working in your neighborhood to protect water quality and the environment.

For more information:
Visit our website: **http://dnr.metrokc.gov/wtd/**
Or write:
Wastewater Treatment Division, Attn: Jo Sullivan
King Street Center, 201 South Jackson St., Suite703
Seattle, WA 98104-3855

This information will be available in alternative formats for individuals with disabilities upon request.

KING COUNTY WASTEWATER TREATMENT DIVISION

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Water Reuse Program UPDATE

Reclaimed Water Technology Demonstration Project
King County's West Point Treatment Plant

Cleaner water, smaller facilities, easier operations—these are the potential benefits offered by many new wastewater treatment technologies. King County is testing a variety of new methods to reclaim wastewater safely and effectively.

Reclaimed water is highly treated wastewater that can be used safely for a variety of non-drinking water uses such as irrigation, recreation and industrial processes. The findings of this project will help make decisions about the technology to be selected for King County's future reclaimed water production facilities. Currently, reclaimed water projects are connected with the regional wastewater treatment plants. King County's first reclaimed water satellite facility is just entering the siting and design phase and will be built in the Sammamish Valley.

What is being tested?

After thoroughly reviewing what technologies are currently available for reclaiming wastewater, we chose to investigate alternatives to both standard and advanced treatment processes. The technologies we are testing may enable us to get cleaner water, smaller facilities, easier operations, and lower costs. Testing will be complete in February 2002.

KING COUNTY WASTEWATER TREATMENT DIVISION

TREATMENT ALTERNATIVES FOR RECLAIMED WATER PROJECTS

Primary

BALLASTED FLOCCULATION

In an effort to enhance the effectiveness of primary treatment, a ballasted flocculation unit uses many minute particles, which attract and hold materials together. Coagulating chemicals are also added to further clump particles together. The larger, heavier particles settle out of the wastewater rapidly. This unit may significantly improve solids and organic material removal compared to conventional primary treatments.

FUZZY FILTER

Wastewater flows from the bottom of this machine to the top through lots of fuzzy pink balls that pick up most of the solid particles. This technology is typically used as an advanced treatment and has not been adapted to primary treatment elsewhere. If it is successful, it could dramatically reduce the size, or footprint, of the primary treatment process.

Secondary

BIOLOGICAL AERATED FILTRATION

Primary treated wastewater and air are injected at the bottom of this unit. It moves to the top through lots of granules. The granules both separate solids and provide a surface for biological activity to take place. Biological Aerated Filtration can provide secondary treatment quality without taking up as much space. In addition, this technology can be adapted to function as a nitrogen removal process (nitrification-denitrification) which may be important if reclaimed water is used in the future to augment stream flow.

MEMBRANE BIOREACTOR

This unit combines an activated sludge secondary treatment bioreactor and a microfiltration membrane. Membranes are submerged in the aeration tank and water is drawn through the membrane with a low-pressure vacuum, leaving the solids in the aeration tank. The Membrane Bioreactor can convert screened sewage to clean effluent in a single process — eliminating the need for separate primary, secondary and advanced treatment. It produces a very high quality effluent meeting Class A criteria (after disinfection). This technology has the potential to significantly reduce plant footprint while producing improved effluent quality.

Advanced

FUZZY FILTER

This upflow filtration process was described at the left as a primary treatment alternative. The porosity of the filter bed can be altered by how compressed the fuzzy pink balls (media) are. In an advanced treatment application the loading rate on a fuzzy filter can be 5 times higher than typical sand filtration. This would result in a substantially smaller footprint.

MICROFILTRATION

Microfiltration membranes are used for physical separation of small particles from liquids. Membranes can be classified according to their pore size. There are four main types of membranes (listed from largest pore size to smallest): microfiltration, ultrafiltration, nanofiltration and reverse osmosis. Membranes are designed to operate in a pressure or vacuum mode. In pressure membranes, the wastewater to be treated is forced down the center of the spaghetti-like membrane and is pushed through the walls in an “inside-out” direction. For vacuum membranes, wastewater is drawn from the outside of the membrane into the hollow core where it is collected. Microfiltration membranes can be designed as strands, sheets or plates depending on the manufacturer and application.

Microfiltration membranes can be used for direct filtration of secondary effluent or as pretreatment for reverse osmosis membranes (see next page). Microfiltration has the potential to produce better effluent quality when compared to standard sand filtration technologies.

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STANDARD WASTEWATER TREATMENT PROCESS

Most of King County’s wastewater flows to one of two regional treatment plants where the wastewater flows through a series of treatment processes that remove waste from the water and protect public health and the environment.

Typically, wastewater treatment begins with **primary treatment** where solids are separated from liquids. This happens in sedimentation tanks.

The next phase of treatment is **secondary treatment**. It is also called **biological treatment** because oxygen is added to wastewater to activate the living organisms (such as bacteria) that eat the dissolved organic material still in the wastewater. King County’s regional treatment plants use an activated sludge treatment process where active microorganisms are maintained at a very high concentration to accelerate the consumption of wastewater organic material.

After secondary treatment, in many municipalities the wastewater is disinfected and released back into the environment.

ADVANCED TREATMENT

Some of the water treated at the regional treatment plants is reclaimed. **Reclaimed water** must be treated beyond secondary treatment to meet Washington State Departments of Health and Ecology Class A standards. This **advanced treatment** traditionally involves filtering the water through sand filters to remove any remaining solids and an extended disinfection process.